Measuring Physical Activity Levels of Nova Scotia Children and Youth
Research Pilot Report January, 2001

Prepared by
Phil Campagna Ph.D. and Dan Nordqvist B.Sc.
School of Health and Human Performance, Dalhousie University
Catherine Tetrault B.Sc.
Nova Scotia Sport and Recreation Commission

Funding and support for the Pilot project was provided by
Department of Community Services
Department of Health
Department of Education
Health Canada - Fitness and Active Living Unit
Central Region Health Board
Cobequid Community Health Board
South Eastern Community Health Board
West Hants Community Health Board
Dalhousie University
N.S. Sport and Recreation Commission
Canadian Fitness and Lifestyle Research Institute (C.F.L.R.I.)

Table of Contents

Introduction 3

Objectives of the Pilot Project 4

Methods 4

Subjects 4

Measurement of Physical Activity 5

Instrumentation 5

Questionnaire 6

Protocol 6

Data Reduction 7

Statistical Analysis 7

Results 7

Discussion 10

Community Involvement 11

Recommendations 11

References: 13

Acknowledgements 15

Appendix A 16

Appendix A-1 17

Information letter to parent or guardian 17

Appendix A-2 19

Informed Consent - Questionnaire (Parent) 19

Appendix A-3 22

Information letter monitoring of physical activity 22

Appendix A-4 24

Informed Consent - Accelerometer (Parent) 24

Appendix A-5 27

Informed Consent - Accelerometer (Child) 27

Appendix A-6 30

Informed Consent - Accelerometer (Parent & Child) 30

Appendix B 33

Appendix B-1 34

Physical Activity Logbook 34

Appendix C 38

Appendix C-1 39

Computer Science and Application (CSA) Model 7164 Version 2.2 accelerometer 39

Introduction

The impetus for this study comes from a growing national and international interest in disease prevention and the recognized link between physical activity and health. In North America it is recognized that physical inactivity is a major health problem (Blair et. al., 1989, Pate et al., 1995). Research clearly shows that physical inactivity is an independent risk factor for coronary heart disease (CHD) (Berlin and Colditz, 1990). Moreover, as many as one third of the deaths in the United Starts from CHD, colon cancer, and type-2 diabetes can be attributed to sedentary living (Blair and Morrow Jr., 1998). Unfortunately, physical inactivity in the population remains a persistent problem despite the known health benefits of physical activity. Consequently, Canadian (Health Canada, 1999) and international organizations (World Health Organization [WHO], 1999) are working to address physical inactivity in populations around the world, and both the young and elderly are prime target groups for research.

In 1997, the federal/provincial and territorial ministers responsible for sport, recreation and fitness made a commitment to reduce the number of physically inactive Canadians by 10% by the year 2003. In Nova Scotia, this goal has been targeted to children and youth.

The Nova Scotia Sport and Recreation Commission formed an interdepartmental committee, Physically Active Children and Youth (P.A.C.Y.) to address children's inactivity in the province. P.A.C.Y. has representatives from Departments of Health, Community Services, Education, and the N.S. Youth Secretariat. P.A.C.Y. is chaired by the Sport and Recreation Commission and has identified research as one of its priority areas.

In April 1999, the Sport and Recreation Commission and Dalhousie University collaborated to host a provincial forum to discuss physical activity among children and youth. Dr. James Sallis, a leader in the field of research on children and physical activity from San Diego State University, gave the keynote, and was a resource at this forum. Delegates developed two key recommendations regarding physical activity and children and youth at this event.

1. That children and youth accumulate 60 minutes of moderate activity within each 24-hour period. Nevertheless, it must be recognized that every minute of physical activity makes some contribution to health.

2. That an objective measure be used to study children's physical activity level for a provincial study i.e. an accelerometer

According to the Canadian Fitness and Lifestyle Research Institute survey using a parent phone proxy, 2/3 of Canadian children are not physically active enough to gain health benefits (CFLRI, 1998). A population study to measure children's physical activity has never been done in Nova Scotia. In order to establish baseline data on the current

physical activity levels of children and youth in this province, an initial research proposal was prepared during the summer of 1999.

In the fall of 1999, plans began for a study to measure the physical activity levels of children and youth in the province. This research is an important first step in establishing a benchmark from which we can measure changes in the physical activity levels of children and youth in the province. Before a provincial study could be undertaken, however, a pilot study needed to be completed to test the methods to be used in a population wide study i.e. the use of an objective instrument - the accelerometer.

Objectives of the Pilot Project

1. To test the methods to be used for the research project i.e. the accelerometer and questionnaire.

2. To compare the results of the accelerometer and the questionnaire in order to determine the necessity of using the accelerometers for the study.

3. Report to the Physically Active Children and Youth (P.A.C.Y.) committee the results of the pilot study of physical activity of children and youth in Nova Scotia.

4. To provide recommendations for a provincial wide study.

Methods

Subjects

The pilot study included students from one high school, two jr. high schools (one rural and one urban) and one elementary school. The school setting was chosen since it was the most convenient location to reach most of the students in the three grade levels. The Dalhousie University Ethics Committee and the Halifax Regional School Board approved the study. An informed consent was obtained from the primary guardian and each child (see appendix A). A contact person was selected for each school with all communication pertaining to the study channeled through this individual.

The data collection took place in two phases - spring and fall due to time constraints. During the spring, data collection subjects were recruited from one high school, one rural and one urban junior high school. The subjects in the high school were selected from grade 11 physical activity and lifestyle classes. Subjects in the urban junior high school were selected from three grade eight classes. In the rural junior high school, subjects were selected from three grade eight physical education classes. During the fall, data collection subjects were recruited from three grade two classes. In total, eighty high school, sixty-eight Jr. high School (urban), forty-six Jr. high school (rural) and seventy elementary school youth students were provided with a packet containing study information (see Appendix A), informed consent documents (see Appendix A), and a parental proxy questionnaire. Table one shows the return rate for the questionnaire.

Table 1 Percent of returned questionnaires

School	# Distributed	# Returned	% Return
High School	80	40	50%
Rural Jr. High School	46	18	39%
Urban Jr. High School	68	19	28%
Elementary School	70	22	31%

The descriptive characteristics of the participants who returned the questionnaires are shown in table 2.

Table 2 Demographic characteristics

School	% Female	% Male	Weight (kg)*	Height (cm)*	Age*
High School	32.5%	60%	67.2+/- 12.6	174.1+/-11.6	15.8+/-0.6
Rural Jr. High School	78%	22%	55.7+/- 9.9	162.6+/-5.2	13.6+/-0.5
Urban Jr. High School	58%	42%	55.1+/-8.3	165.1+/-5.4	13.7+/-0.5
Elementary School	50%	50%	26.3+/-5.1	122.8+/-7.6	7.2+/-0.4

*Mean +/- Standard Deviation

The returned parental questionnaires were sent to the Canadian Fitness and Lifestyle Institute (CFLRI) for analysis which grouped each subject into one of four physical activity levels – light, moderate, high or very high. In order to obtain a proportional representation of the four activity levels students were randomly selected from the high school, Jr. high school and elementary school. A stratified sample of twenty students from the high school, ten from each of the Jr. high schools and seventeen elementary school subjects were selected to participate in the second part of the study.

Subjects for the activity-monitoring portion of the study were provided with a packet containing informed consent documents for the parents, consent form for the child and a letter explaining the second part of the study (see Appendix A). In addition, a physical activity logbook was also given to each subject.

Measurement of Physical Activity

Instrumentation

The Computer Science and Applications Inc. (CSA) accelerometer (Actigraph model 7164) was used to obtain an objective measure of physical activity (see Appendix C). The CSA unixal accelerometer is designed to detect vertical accelerations ranging in magnitude from 0.05 to 2.00 G's with a frequency response of 0.25 to 2.50 hertz. These parameters have been shown to allow for normal human motion with the rejection of high frequency vibrations from other sources. The acceleration signal is filtered and digitized

with the magnitude summed over a user specific interval of time. At the end of each interval, the summed value or activity "count" is stored in memory and the numerical integrator is reset. For the present study, a one-minute sampling interval was used and data collected over 7 continuous days. Previous research has shown that a 7-day data collection period provides reliable estimates of usual physical activity patterns of children and youth (Trost et al., 2000).

The CSA accelerometer has been shown to be a valid and reliable tool for assessing physical activity in children and youth (Janz, 1994; Trost et al., 1998).
There are certain limitations with the accelerometer, which include the fact that they are not waterproof and therefore cannot be worn for activities such as swimming.

Questionnaire
The C.F.L.R.I. parent proxy questionnaire has been used as a telephone survey across Canada. This questionnaire is part of a large telephone survey that asked adults about their physical activity levels. During the telephone interviews, some adults were asked if they have children, and if so, would they complete the questions about their children's physical activity habits. The researchers gained permission from C.F.L.R.I. to use their proxy questionnaire for the Pilot. It was explained to them that for the purposes of the Pilot, the questionnaire would be given to the parents to complete, not conducted by phone interview.

Protocol
The activity monitor was placed on the right hip of each subject at the beginning of the first school day. The unit was held firmly against the body in Velcro pouches secured with a waist strap to insure consistency and proper positioning among the subjects. The placement at the hip permitted measurement of whole body movement and is the most frequently used site in epidemiological studies. The unit is small (5 x 4 x 1.5 cm), lightweight (43 grams) and will not interfere with activities of daily living.

Students were instructed to wear the activity monitor during all waking hours except when showering and to record any time that the monitor was not worn (e.g. swimming) in their activity logbook. In addition, students were instructed to record their physical activity for each day that the activity monitor was worn in the logbook. For the elementary students, the parent in consultation with the child completed the logbook.

Table 3 shows the gender distribution for the subjects participating in the accelerometer part of the study.

Table 3 Gender distribution for accelerometer participants

School	% Female	% Male
High School	46%	54%
Rural Jr. High School	80%	20%
Urban Jr. High School	44%	56%
Elementary School	53%	47%

The descriptive statistics for these subjects can be found in table 4.

Table 4 Descriptive statistics for accelerometer subjects

School	Weight (kg)*	Height (cm)*	Age*
High School	63.1+/-9.2	167.1+/-12.9	15.8+/-.7
Rural Jr. High School	52.2+/-8.5	138.9+/-4.3	13.4+/-.5
Urban Jr. High School	58.6+/-8.4	147.4+/-8.8	13.8+/-.4
Elementary School	26.6+/-5.2	121.6+/-8.0	7.2+/-.4

*Mean +/- Standard Deviation

Data Reduction

After the seven days of data collection the stored activity counts were downloaded to an IBM compatible computer. The CSA accelerometer data was reduced using custom software developed for this project. The software categorised each count per minute value into light (<3 METS), moderate (3-5.9 METS), hard (6-8.9 METS) or very hard (>9 METS) activity. A MET (metabolic equivalent) is an index of the intensity of activities. 1 MET is resting energy expenditure, therefore 4 METs would equal four times resting state. The software also calculated 15 minute counts and categorised these into one of the four intensities. Age specific count ranges corresponding to the above intensity (METS) levels were derived from an equation developed by Freedson et al. (2000). It was assumed that the students wore the accelerometer during the entire waking period and that 0 counts recorded were the non-monitored time (sleep).

Statistical Analysis

Percent calculations were used to determine the number of students that achieved the physical activity recommendations - sixty minutes of moderate physical activity daily. A Pearson's Product Moment Correlation was used to compare the CFLRI parent-proxy questionnaire and the CSA accelerometer. The returned CFLRI questionnaire data gave an overall daily intensity rating in MET-HRs, therefore, for comparative purposes the CSA accelerometer data was converted to MET-HRs.

Results

Thirteen high school students completed the physical activity portion of the study. Six did not give consent, one monitor was lost and one monitor data was incomplete. Thirty-one percent of the high school students accumulated 60 minutes or more of physical activity on 5 more days of the week, with 62% accumulating 30 minutes or more of physical activity (see Table 5).

Table 5 Number of students from high school above and below the recommended physical activity levels.

Minutes	Males	Females	Total
>60*	2	2	4

>30 - <60**	2	2	4
<30	3	2	5

* Recommendation from the "Forum on Physical Activity Among Children and Youth in Nova Scotia"
** Recommendation from the American College of Sports Medicine & Centre for Disease Control and others for Adults, Youth & Children

Eighteen of the twenty junior high school students completed the study. Thirty-three percent of the junior high school students accumulated 60 minutes or more of physical activity on 5 more days of the week, with 66% accumulating 30 minutes or more of physical activity (see Table 6).

Table 6 Number of students from junior high school above and below the recommended physical activity levels.

Minutes	Males	Females	Total
>60*	3	3	6
>30 - <60**	2	4	6
<30	1	5	6

* Recommendation from the "Forum on Physical Activity Among Children and Youth in Nova Scotia"
** Recommendation from the American College of Sports Medicine & Centre for Disease Control and others for Adults, Youth & Children

Seventeen grade two students from the elementary school completed the study. One hundred percent of the students accumulated 60 minutes or more of physical activity on 5 more days of the week. (see Table 7).

Table 7 Number of students from elementary school above and below the recommended physical activity levels.

Minutes	Males	Females	Total
>60*	8	9	17
>30 - <60**	0	0	0
<30	0	0	0

* Recommendation from the "Forum on Physical Activity Among Children and Youth in Nova Scotia"
** Recommendation from the American College of Sports Medicine & Centre for Disease Control and others for Adults, Youth & Children

A correlation of $r = -0.24$ was found between the parental proxy questionnaire and the CSA accelerometer for high school students (see Figure 1)

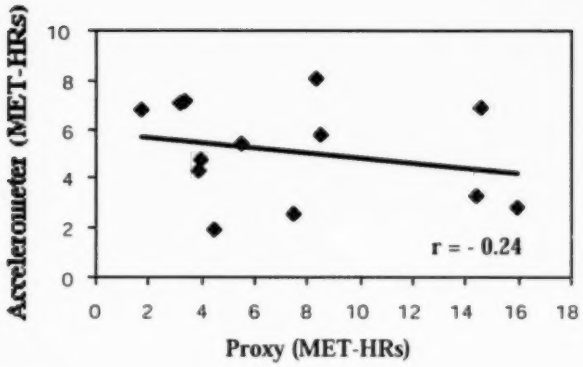

Figure 1 Comparison of the parental-proxy and the CSA accelerometer for high school students.

A correlation of r = 0.50 was found between the parental proxy questionnaire and the CSA accelerometer for junior high school students (see Figure 2). For the elementary school students a correlation of r = 0.003 was found (see Figure 3).

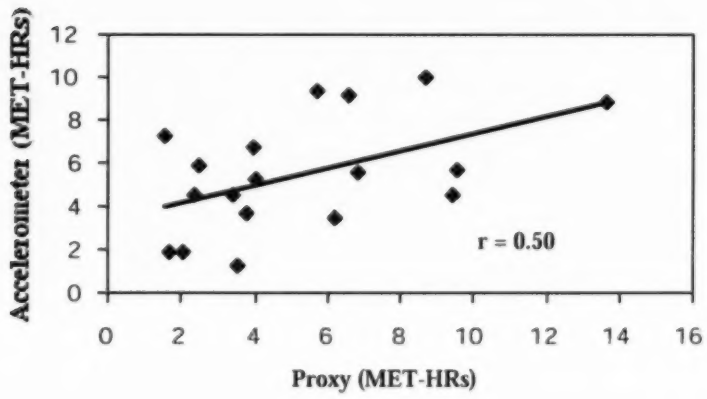

Figure 2 Comparison of the parental-proxy and the CSA accelerometer for junior high school students.

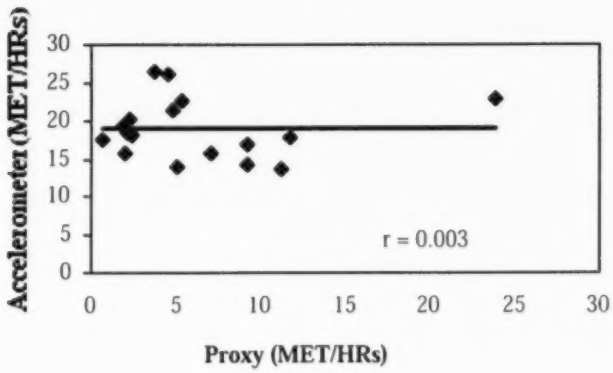

Figure 3 Comparison of the parental-proxy and the CSA accelerometer for elementary school students.

Discussion

It would appear from this study that grade two students are active enough to meet the recommendations from the Forum on Physical Activity Among Children and Youth in Nova Scotia. This is in agreement with Tremblay and Haines (2000) recent report that all elementary school children (grade 1 and 2) achieved the moderate physical activity recommendation. Only approximately 1/3 of junior high and high school students, however, meet the physical activity recommendations which is similar to the results reported by the National Population Health Survey (NPHS, 1999). This survey found that only 35% of youth are active enough to achieve optimal health benefits.

A very low correlation between the accelerometer and the proxy questionnaire was found for all grades. The questionnaire sometimes overestimated the child's activity level, and sometimes it underestimated the level. This makes any conclusions about the actual physical activity level of a child impossible to do without the objective measure of the accelerometer. The low correlation found with the CSA accelerometer and the parent-proxy questionnaire for all grades indicates that the same students were not being identified as inactive. Another possible explanation as to why the parent-proxy may not be identifying the same inactive children as the accelerometer is the difficulty in reporting moderate levels of physical activity. It has been found that moderate levels of activity are difficult to recall in an adult population (Sallis and Owen, 1999). Parents may be capable of reporting activities that are of a vigorous nature but may not be aware of the type of activity that is of a moderate level.

Limitations of the study include sample size, the number of days data was collected for some subjects and variability of activity levels because of exams. A possible reason for

the low return rate of the questionnaires for junior high and high school students may be due to the time of year and the distraction of final exams. For elementary school children the questionnaire was distributed close to Christmas and therefore, parents may not have completed it.

Community Involvement

Communities are responsible for ensuring children and youth live in an environment conducive to good health. Members of a community can work together toward the common goal of active, healthy children and youth.

Although the P.A.C.Y. study is provincial in scope, it will be the individual communities in Nova Scotia, who will be able to use the results of the research to create programs and policies that will help children and youth become more physically active. Obviously, for any community to make these changes, it first needs to buy in to the importance of the issue and find ways for more children and youth to be active. For this reason, a community involvement component was included in the Pilot study.

The process of involving the community began with a meeting of key community members from one of the communities, which has a school in the Pilot.

The purpose of the meeting was to gather stakeholders who have an influence on children and youth physical activity to inform them of the project, have some discussion about the issue, and to generate interest in addressing inactivity in that community. People were contacted by phone and invited to the meeting. Agencies invited included the Sackville Sportsplex, H.R.M. Parks and Recreation, the Community Health Board, R.C.M.P., the school, and the local day care. The meeting was hosted by the Sport and Recreation Commission and held at HT Barrett Junior High school.
During the meeting, Dalhousie gave an overview of the research, then there was an opportunity to ask questions about the research. Following the presentation, attendees discussed some of the opportunities and barriers for physical activity for children and youth in the community. Notes were taken at the meeting and later distributed to those who were in attendance. The group agreed to attend another meeting in the Fall to discuss possible ways to work together to improve the physical activity levels of the children and youth in that community.

At the time this report was completed, the schools for the provincial study had not been selected. Once the schools have been selected for the province wide study, there will be an attempt to hold similar meeting across N.S. with groups who can help children and youth become more physically active.

Recommendations

1. All grade two students' activity level exceeded the recommendations. This is consistent with a study done in New Brunswick among children of similar grades.

The researchers, therefore, recommend grade two students not be measured during the provincial study, but two older elementary grades be measured i.e. grades four and six.

2. Since there was a major discrepancy in the results of the accelerometer and the results of the proxy questionnaire, it is recommended that the accelerometer be used to insure an accurate, objective measure of children's physical activity levels.

3. With regards to the questionnaire, it is recommended that a modified version of the proxy questionnaire be used to gather qualitative information on the physical activity patterns of children.

4. To obtain a greater return of the questionnaire a notification letter regarding the study should be sent home the day before the packet is sent home. A telephone call to the parent the day that the packet is received by the child should be made to notify the parent that the child has received the packet and to answer any questions that the parent may have.

5. It is recommended that for the activity portion of the study that the retrieval of the accelerometer be delayed for one day to insure that all the accelerometers be returned. For example if the accelerometer were placed on the subject on Monday the accelerometer would be retrieved on Tuesday.

6. Provide an incentive for all students to return the accelerometers such as a bowling, swim, or skating pass.

7. For the provincial study, offer an incentive for the class who had the highest or quickest return of questionnaires and consent forms.

8. Contact the school boards as early as possible for permission to enter the schools.

9. If possible set up a meeting with parent and student before commencing the study.

References:

Berlin, J.A. and Colditz, G.A. (1990). A meta-analysis of physical activity in the prevention of coronary heart disease. **American Journal of Epidemiology**, 132, 612-628.

Blair, S.N., Kohl, H.W., Paffenbarger, R.S., Clark, D.G., Cooper, K.H. & Gibbions, L.W. (1989). Physical fitness and all-cause mortality: A prospective study of healthy men and women. **Journal of the American Medical Association**, 262, 2395-2401.

Blair, S.N. and Morrow, Jr. J.R. (1998). Introduction: Cooper Institute/A ıerican College of Sports Medicine 1997 Physical Activity Intervention Conference. **American Journal of Preventative Medicine**, 15, 255-256.

Canadian Fitness and Lifestyle Institute Physical activity monitor, (1997,1998, 1999), Ottawa, ONT

Freedson, P.S., Sirard, J., Debold, N, Trost, S., Dowda, M., Pate, R. and Sallis, J. (2000) Calibration of a uniaxial accelerometer for estimating exercise intensity in children and youth. **Medicine and Science in Sports and Exercise**, (In Press).

Health Canada (1999). Canada's Physical Activity Guide Web site {on-line}. Available: www.pa.guide.com

Janz, K.F. (1994) Validation of the CSA accelerometer for assessing children's physical activity. **Medicine and Science in Sports and Exercise**, 26, 369-375.

1996 - 1997 National Population Health Survey (1999) Ottawa, ONT. Statistics Canada.

Pate, R.R. Pratt, M., Blair, S.N. et al (1995). Physical activity and public health: A recommendation from the Centers for Disease Control and the American College of Sports Medicine, **Journal of the American Medical Association**, 273, 402-407.

Sallis, J.F. and Owen, N. (1999) **Physical Activity and Behavioral Medicine**, Sage Publications Inc., Thousand Oaks, California

Tremblay, M.S. and Haines, C.A. (2000) Physical Activity Levels of young school children. Abstract published in the Pre-Olympic Scientific Congress Proceedings, pp. 308.

Trost, S.G., Pate, R.R., Freedson, P.S., Sallis, J.F. and Taylor W.C. (2000) Using objective physical activity measures with youth: How many days of monitoring are need? **Medicine and Science in Sports and Exercise**, 32, 426-431.

Trost S.G., Ward, D.S., Moorehead, S.M., Watson, P.D., Riner, W., Burke, J. (1998) Validity of the computer science and application (CSA) activity monitor in children. **Medicine and Science in Sports and Exercise**, 30, 629-633.

World Health Organization (1999). Active living [on-line]. Available: http://www.who.int/hpr/active/index.html

Acknowledgements

Thank you to the students and staff of the following schools for their co-operation in participating in the Pilot study.

- Gorsebrook Junior High School
- Queen Elizabeth High School(Q.E.H.)
- Harold T Barrett Junior High School
- Harry R. Hamilton Elementary School

Thank you to the following individuals for their participation in the pilot study:

- Dr. Gary Ness, Acadia University
- Dr. Roy Rasmussen, St. Francis Xavier University
- Dr. Rob Hood, Dalhousie University
- Dr. John Kozey, Dalhousie University
- Mr. Mike Arthur, Sport & Recreation Commission

Appendix A

Letters and Informed Consents

Appendix A-1 Information letter to parent or guardian

Appendix A-2 Informed Consent - Questionnaire (Parent)

Appendix A-3 Information letter monitoring of physical activity

Appendix A-4 Informed Consent - Accelerometer (Parent)

Appendix A-5 Informed Consent - Accelerometer (Child)

Appendix A-6 Informed Consent - Accelerometer (Parent & Child)

Appendix A-1
Information letter to parent or guardian

Dear Parent:

Two researchers at Dalhousie University---Phil Campagna and John Kozey ---are collaborating with the Nova Scotia Sport and Recreation Commission and other provincial departments to do a research study. The study is important to help us answer the question "How active are Nova Scotia children and youth?"

The study involves children and youth from 4 schools in the Halifax Region. Both boys and girls in three age groups are being invited to participate (7-9, 12-14, and 16-18 year olds). This letter is a formal invitation for you and your son/daughter to participate. This invitation is based simply on the fact that your school is one of those chosen by the researchers, and your daughter/son is in the age group selected at your school.

The study has two phases. First, we are inviting you, and about 240 other parents of children from the 4 schools, to participate by completing a short questionnaire. The questions are about your son/daughter's physical activity. The questionnaire with consent form is attached to this letter. The results will give us an estimate of this group of children and youth's level of physical activity.

Second, 80 to 100 children and youth (selected from the original 240) will be invited to participate in a "week long" study. This phase of the study will involve monitoring physical activity during a week of normal activity. Children and youth will be invited based on their willingness to participate and their parent's support. The participants will include an equal number of boys and girls with a range of physical activity levels estimated from the original questionnaire. Please note that all 240 participants from the first phase will not participate in the second phase of the study.

If your child is selected to participate in the second phase, you will receive a letter with a more detailed description of phase two and another formal invitation to participate. At this point we are inviting you to participate in phase one only.

Again, we are requesting your support in the study along with support from teachers and school personnel. We believe the success of the study depends on a cooperative effort among us researchers, the children and youth, you parents, and the teachers at the school.

If you agree to participate, please read the attached form titled Informed Consent and sign at the bottom in the space given. (A second copy of the consent form is included for your own files.) Then complete the questionnaire, place the completed questionnaire and signed consent form in the return envelope, and ask your daughter/son to deliver the envelope to their teacher or contact person at the school.

If you have any questions about the study, please contact Phil Campagna at 494-1145 during weekdays. There is also an independent contact at the Dalhousie Ethics office. Their telephone number is 494-6513

We look forward to your child participating in this study, and we hope you view this study as we do -- an investment in our children and youth for today and tomorrow.
Sincerely,

_____

Phil Campagna, PhD 494-1145
Associate Professor, Dalhousie University

_____

John Kozey, PhD 494-1148
Assistant Professor, Dalhousie University

Appendix A-2
Informed Consent - Questionnaire (Parent)

Title: Measuring Physical Activity Levels of Nova Scotia Children and Youth: A Pilot Study

Researchers: Phil Campagna, PhD 494-1145
John Kozey, PhD 494-1148

Independent Contact: Dalhousie Research Ethics Office 494-6513

Purpose:

The purpose of this research study is to measure physical activity for a small group of children and youth. The study has two phases. Phase one asks parents of 240 children and youth to complete a short survey questionnaire. The results will provide an estimate of this group of children and youth's level of physical activity, and when and where they are most active. Upon completing this form and attached questionnaire your son/daughter will be included in phase one of the study.

Procedure:

Four schools were selected by the researchers, and approved by the Halifax Regional School Board. Approximately 60 children/youth in one of three age groups (7-9, 12-14 or 16-18 years of age) were selected at each school. Therefore, your child was selected simply because he/she is in one of the age groups and attends one of the 4 schools selected for this research study.

At school, the selected children/youth were asked to deliver to a parent/legal guardian an envelope containing a letter introducing the study, this consent form (and a duplicate for your records), and a survey questionnaire. The parent is asked to read the letter and the consent form. If agreeing to participate, the parent signs the consent form, and completes the questionnaire. The questions are about their child/youth's physical activities that are done at 1) school, 2) home, 3) outside home and 4) work (if applicable). The questionnaire requires about 10 minutes to complete. Upon signing the consent form and completing the questionnaire, both are returned in the envelope to the teacher or other school contact person. The parent keeps the letter and the duplicate copy of the consent form for their records. If selected to participate in phase two of the study, both child and parent will receive a second letter requesting voluntary participation and details about phase two.

Potential harms:

There are no foreseeable harms that might result from completing this questionnaire and participating in the study.

Potential benefits:

There is likely little if any benefit for you or your child in participating in this study. You may benefit by becoming more aware of your child's physical activity level. The study is intended to benefit children, youth and society in general as we learn more about physical activity and its association to health. If we find that our children and youth are not sufficiently physically active we will be able to work toward ways to improve opportunities for physical activity in the lives of children and youth.

Confidentiality:

Your child's name will be assigned a code number. The code numbers, not names, will be used to identify the questionnaires. The list of names and matching codes will be stored in the project research office at the School of Health and Human Performance at Dalhousie University. Only the researchers will have access to the list. The physical activity data and all results of data analysis will be reported, presented or published without identifying individual children. Study participants and their parents have the right to request a summary of their individual data upon completion of the study.

Voluntary Participation:

Participation in this study is completely voluntary, and participants are free to withdraw at any time for any reason. If you have any questions about the study you can contact, by the telephone, the researchers listed above. An independent contact is the Dalhousie Research Ethics Office. See above for telephone number.

Consent:

Measuring Physical Activity Levels of Nova Scotia Children and Youth: A Pilot Study

I have read the attached letter and the above information describing the research study, and I have decided to participate in phase one of the study. I understand my participation is voluntary, and that I may withdraw from the study at any time for any reason. My signature below shows I will participate in the study.

_____ _____

Name of parent or legal guardian Signature of parent or legal guardian

I have received a copy of this form for my records.

_____

Date

Appendix A-3
Information letter monitoring of physical activity

Dear Parent:

Thank-you for participating in the first phase of the research by completing and returning the questionnaire about your child's physical activity. Now we are inviting you and your son/daughter to participate in phase two. Again, the study is important to help us answer the question "How active are Nova Scotia children and youth?"

Phase two of the study involves 80 to 100 children and youth from the same 4 schools in phase one. Both boys and girls in three age groups are being invited to participate (7-9, 12-14, and 16-18 year olds). This phase of the study will involve monitoring physical activity during a week of normal activity. The researchers will include an equal number of boys and girls that represent a variety of physical activity levels estimated from the questionnaire data.

The purpose of the second phase of the research study is to measure physical activity with an accelerometer; a small digital device designed to fit comfortably on a belt or top of the pants. Previous studies have shown the device is easy to use and does not interfere with normal activities. During the week we will ask your child to wear the accelerometer and simply carry-on with his or her normal weekly routine. Also, each child is requested to keep a log of activities in a small logbook designed for this study.

Please note that participants, parents, and the Halifax Regional School Board are not liable for the loss or damage of any accelerometer used in the study. However, it is assumed that participants will be careful with the equipment used in the study.

The data from the accelerometer, when compared to the physical activity questionnaire you completed, will help us to learn the most effective way to measure physical activity in preparation for a larger study across Nova Scotia.

Again, we are requesting your support in the study along with support from teachers and school personnel. We believe the success of the study depends on a cooperative effort among us researchers, the children and youth, you parents, and the teachers at the school.

Details describing the procedure for wearing the accelerometer are described on a separate sheet attached to this letter. Also, there are instructions on how to use the logbook.

If you agree to participate, please read the attached form titled Informed Consent and sign at the bottom in the space given. A separate consent form is included for your son/daughter to sign. Duplicate copies of the consent forms are included for your own files. Then place the signed consent forms in the return envelope, and ask your daughter/son to deliver the envelope to their teacher or contact person at the school. Upon

receiving the signed consent forms, your daughter/son will receive instructions at school on wearing the accelerometer and using the logbook.

If you have any questions about the study, please contact Rob Hood at 494-1157 during weekdays. There is also an independent contact at the Dalhousie Ethics office. Their telephone number is 494-6513. We look forward to your child participating in this study, and we hope you view this study as we do -- an investment in our children and youth for today and tomorrow.
Sincerely,

_____
Phil Campagna, PhD 494-1145
Associate Professor, Dalhousie University

_____
John Kozey, PhD 494-1148
Assistant Professor, Dalhousie University

_____
Robert Hood, PhD 494-1157
Assistant Professor, Dalhousie University

Appendix A-4
Informed Consent - Accelerometer (Parent)

Title: Measuring Physical Activity Levels of Nova Scotia Children and Youth: A Pilot Study

Researchers: Phil Campagna, PhD 494-1145
John Kozey, PhD 494-1148

Independent Contact: Dalhousie Research Ethics Office 494-6513

Purpose:

The purpose of this research study is to measure physical activity for a small group of children and youth using accelerometers. An accelerometer is a small device designed to fit comfortably on a belt or on top of the pants. The study, when compared to the physical activity questionnaire you completed earlier, will help us to learn the most effective way to measure physical activity. Also, we will begin to learn how physically active children and youth are today, and when and where they are most active.

Procedure:

Your child was selected as one of 20-25 children from the larger group of 60 children/youth in his/her school who had their parent complete the questionnaire on physical activity. This group was selected to allow a similar number of boys and girls to participate, and to represent a variety of physical activity levels.

Your child will be asked to wear an accelerometer for one week (a description of a typical day is described on an attached sheet). The accelerometer fits comfortably onto a belt or on top of the pants. Previous studies have shown the device is easy to use and does not interfere with normal activities. During the week we ask that your child simply carry-on with his or her normal weekly routine.

Please note that participants, parents, and the Halifax Regional School Board are not liable for loss or damage of any accelerometer used in the study. However, it is assumed that participants will be careful with the equipment used in the study.

A physical education teacher or other school representative will be asked to serve as the contact person and liaison between the research team, participants and parents. Participants, with the help of their parents and physical education teacher, will be asked to record their physical activities each day of the study's duration. This information will be written in a logbook designed for this purpose.

Study participants and their parents have the right to ask questions about the procedure at anytime before, during, and after the study period.

At the conclusion of the study, all participants and their parents will have an opportunity to meet with the research team at the participant's school. The purpose of the meeting is to share the study results, respond to final questions about the study, and discuss the procedures used in the study. This meeting will occur in the evening at the school. The date of the meeting will be announced after the data has been summarized in a report.

Potential harms:

The accelerometer is lightweight and worn around the waist, so the potential for injury from falling on it during physical activity is minimal. Note that your child will not be asked to participate in any physical activity other than his or her normal activities.

Potential benefits:

There is likely little if any benefit for you or your child in participating in this study. You may benefit by becoming more aware of your child's physical activity level. The study is intended to benefit children, youth and society in general as we learn more about physical activity and its association to health. If we find that our children and youth are not sufficiently physically active we will be able to work toward ways to improve opportunities for physical activity in the lives of children and youth. Nationally and internationally this is becoming a health priority.

Confidentiality:

Your child's name will be assigned a code number. A list of names and matching codes will be stored in the project research office at the School of Health and Human Performance at Dalhousie University. Only the researchers will have access to the list. The physical activity data and all results of data analysis will be reported, presented or published without identifying individual children. Study participants and their parents have the right to request a summary of their individual data upon completion of the study.

Voluntary Participation:

Participation in this study is completely voluntary, and participants are free to withdraw at any time for any reason. If you have any questions about the study you can contact, by the telephone, the researchers listed above. An independent contact is the Dalhousie Research Ethics Office. See above for telephone number.

Consent:

Measuring Physical Activity Levels of Nova Scotia Children and Youth: A Pilot Study

I have read the attached letter and the above information describing the research study, and I agree to allow my child to participate in the study. I understand my child's

participation is voluntary, and that he or she may withdraw from the study at any time for any reason. My signature below shows that my child and I will participate in the study.

_____ _____

Name of parent or legal guardian Signature of parent or legal guardian

I, , have received a copy of this form for my records

_____

Date

Appendix A-5
Informed Consent - Accelerometer (Child)

Title: Measuring Physical Activity Levels of Nova Scotia Children and Youth: A Pilot Study

Researchers: Phil Campagna, PhD 494-1145
John Kozey, PhD 494-1148

Independent Contact: Dalhousie Research Ethics Office 494-6513

Purpose:

The purpose of this research study is to measure physical activity for a small group of children and youth using accelerometers. An accelerometer is a small device designed to fit comfortably on a belt or top of the pants. The study, when compared to the physical activity questionnaire completed by your parent, will help us to learn the most effective way to measure physical activity. Also, we will begin to learn how physically active children and youth are today, and when and where they are most active.

Procedure:

You have been selected as one of 20-25 children/youth from the larger group of 60 who had their parent complete an earlier questionnaire on physical activity. You and the others in your school were selected to allow an equal number of boys and girls to participate, and to represent a variety of levels of physical activity.

You will be asked to wear an accelerometer for one week (a description of a typical day is described on an attached sheet). The accelerometer fits comfortably on a belt. Previous use has shown that the device is easy to use and does not interfere with normal activities. During the week we ask that you simply carry-on with your normal weekly routine.

Please note that you are not liable for loss or damage of the accelerometer used in the study. However, we request that you be careful with the accelerometer to so it works effectively during the study.

A physical education teacher or other school representative will be asked to be the contact person between you, your parents and the research team. Also, with the help of your parents and physical education teacher, you will be asked to keep a record of your physical activities each day of the study's duration. You will be given a booklet to record this information.

You and your parents have the right to ask questions about the study at anytime before, during, and after the study.

At the end of the study, all participants and their parents will have an opportunity to meet with the research team at the participant's school. The purpose of the meeting is to share the study results and respond to final questions about the study. This meeting will occur in the evening at the school. The date of the meeting will be announced after the data has been summarized in a report.

Potential harms:

The accelerometer is small and lightweight and worn around the waist, so the potential for injury from falling on it during physical activity is minimal. You will not be asked to participate in any physical activity other than your normal activities.

Potential benefits:

There is likely little if any benefit in participating in this study. You may benefit by becoming more aware of your physical activity level. The study is intended to benefit children, youth and society in general as we learn more about physical activity and how it relates to health.

Confidentiality:

You will be assigned a code number. A list of names and matching codes will be stored in the project research office at the School of Health and Human Performance at Dalhousie University. Only the researchers will have access to the names of the participants. The physical activity data and all results of data analysis will be reported, presented or published without identifying you and any other individual children. You and your parents have the right to request a summary of your data after the study is over.

Voluntary Participation:

Participation in this study is completely voluntary, and participants are free to withdraw at any time for any reason. If you have any questions about the study you can contact, by the telephone, the researchers listed above. An independent contact is the Dalhousie Research Ethics Office. See above for telephone number.

Consent:

Measuring Physical Activity Levels of Nova Scotia Children and Youth: A Pilot Study

I have read the attached letter and the above information describing the research study, and I agree to participate in the study. I understand my participation is voluntary, and

that I may withdraw from the study at any time for any reason. My signature below shows that I will participate in the study.

_____ _____

Name of child/youth participant Signature of child/youth participant

I, , have received a copy of this form for my records

_____

Date

Appendix A-6
Informed Consent - Accelerometer (Parent & Child)

Title: Measuring Physical Activity Levels of Nova Scotia Children and Youth: A Pilot Study

Researchers: Phil Campagna, PhD 494-1145
John Kozey, PhD 494-1148

Independent Contact: Dalhousie Research Ethics Office 494-6513

Purpose:

The purpose of this research study is to measure physical activity for a small group of children and youth using accelerometers. An accelerometer is a small device designed to fit comfortably on a belt or on top of the pants. The study, when compared to the physical activity questionnaire you completed earlier, will help us to learn the most effective way to measure physical activity. Also, we will begin to learn how physically active children and youth are today, and when and where they are most active.

Procedure:

Your child was selected as one of 20-25 children from the larger group of 60 children/youth in his/her school who had their parent complete the questionnaire on physical activity. This group was selected to allow a similar number of boys and girls to participate, and to represent a variety of physical activity levels.

Your child will be asked to wear an accelerometer for one week (a description of a typical day is described on an attached sheet). The accelerometer fits comfortably onto a belt or on top of the pants. Previous studies have shown the device is easy to use and does not interfere with normal activities. During the week we ask that your child simply carry-on with his or her normal weekly routine.

Please note that participants, parents, and the Halifax Regional School Board are not liable for loss or damage of any accelerometer used in the study. However, it is assumed that participants will be careful with the equipment used in the study.

A physical education teacher or other school representative will be asked to serve as the contact person and liaison between the research team, participants and parents. Participants, with the help of their parents and physical education teacher, will be asked to record their physical activities each day of the study's duration. This information will be written in a logbook designed for this purpose.

Study participants and their parents have the right to ask questions about the procedure at anytime before, during, and after the study period.

At the conclusion of the study, all participants and their parents will have an opportunity to meet with the research team at the participant's school. The purpose of the meeting is to share the study results, respond to final questions about the study, and discuss the procedures used in the study. This meeting will occur in the evening at the school. The date of the meeting will be announced after the data has been summarized in a report.

Potential harms:

The accelerometer is lightweight and worn around the waist, so the potential for injury from falling on it during physical activity is minimal. Note that your child will not be asked to participate in any physical activity other than his or her normal activities.

Potential benefits:

There is likely little if any benefit for you or your child in participating in this study. You may benefit by becoming more aware of your child's physical activity level. The study is intended to benefit children, youth and society in general as we learn more about physical activity and its association to health. If we find that our children and youth are not sufficiently physically active we will be able to work toward ways to improve opportunities for physical activity in the lives of children and youth. Nationally and internationally this is becoming a health priority.

Confidentiality:

Your child's name will be assigned a code number. A list of names and matching codes will be stored in the project research office at the School of Health and Human Performance at Dalhousie University. Only the researchers will have access to the list. The physical activity data and all results of data analysis will be reported, presented or published without identifying individual children. Study participants and their parents have the right to request a summary of their individual data upon completion of the study.

Voluntary Participation:

Participation in this study is completely voluntary, and participants are free to withdraw at any time for any reason. If you have any questions about the study you can contact, by the telephone, the researchers listed above. An independent contact is the Dalhousie Research Ethics Office. See above for telephone number.

Consent:

Measuring Physical Activity Levels of Nova Scotia Children and Youth: A Pilot Study

I have read the attached letter and the above information describing the research study, and I agree to allow my child to participate in the study. I understand my child's

participation is voluntary, and that he or she may withdraw from the study at any time for any reason. My signature below shows that my child and I will participate in the study.

_____	_____
Name of parent or legal guardian	Signature of parent or legal guardian
---	---
Name of child participant	Signature of child participant

I, , have received a copy of this form for my records

_____

Date

Appendix B

Physical Activity Logbook

Appendix B-1
Physical Activity Logbook

INSTRUCTIONS FOR THE USE OF THE ACCELEROMETER & LOGBOOK:

Accelerometer:

Wear the accelerometer snugly on the right side of your waist

Start wearing the accelerometer as soon as you get dressed each day. The accelerometer should be worn until you go to bed with exception of when you take a shower, swim or any other activity that can get the device wet. Please record each day in your logbook the time when you put on the accelerometer and when you take it off. Also include in your log book any times during the day when you take the accelerometer off i.e. when showering, swimming or other activities that prevent you from wearing the device.

Do not use the accelerometer when:

- In the shower
- While swimming or any other conditions, such as heavy rain, that may get the accelerometer wet.
- Or while sleeping

Logbook:

- Please record all activities that you do during the day.
- This includes all activities that you do from 7 am (excluding sleeping) until 10 pm or earlier if you go to sleep before this time.
- Examples of activities: Phys ed., biking, running, soccer, football, dancing, class, recess, lunch, etc.

Name:_____

Date:_____

Time Accelerometer was placed on right hip: _____

Day 1			
TIME	What did you do? Please specify activity Ex: running, watching tv, etc.	Time Began	Time Ended
7:00 AM			

Day 1			
TIME	What did you do? Please specify activity Ex: running, watching tv, etc.	Time Began	Time Ended
12 noon			
5:00 PM			

Time when accelerometer was taken off: _____

Day 1			
TIME	What did you do? Please specify activity Ex: running, watching tv, etc.	Time Began	Time Ended
5:00 PM			
10:00 PM			

Appendix C

Photograph of accelerometer and contact information

Appendix C-1
Computer Science and Application (CSA) Model 7164 Version 2.2 accelerometer

Computer Science and Applications, Inc.
2 Clifford Drive, Shalimar, FL. 32579
Ambulatory Monitoring Division Contact Location:

Tel: (850)-651-0695 / (850)-651-0712 Fax: (850)-651-0697
Email: csaincmfg@fwb.gulf.net

Corporate Headquarters:
Tel: (850)-651-4991 ext. 215 Fax (850)-651-2816

Email: csainc@fwb.gulf.net